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Section I

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IN THIS ISSUE

Further Thoughts on the Management Aspect of Accounting Control, by S. A. Peck..... 549

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EDITORIAL DEPARTMENT NOTE

Last year Mr. S. A. Peck, Vice President of the Trundle Engineering Co., gave a talk before the Buffalo Chapter on the subject, "The Managerial Aspect of Controls." That talk, published in the *N. A. C. A. Bulletin* for December 15, 1938, dealt with the marginal income method of studying the relationships between expenses, volume and profit, and was concerned largely with exterior applications such as the effect of pricing, sales volume and costs on the profit-volume relationship. Recently Mr. Peck, in presenting the marginal income technique before a meeting of the Columbus Chapter, illustrated its application to interior or internal problems, and the paper which he presented at that time seemed so valuable as a supplement to his earlier paper that it is being presented in this issue of the *Bulletin*.

A graduate of Purdue University with the B.S. degree in Mechanical Engineering in 1914, Mr. Peck secured his early business experience with the Diamond Chain & Mfg. Co. as Factory Cost Accountant and later Factory Manager. This connection was interrupted from 1917 to 1919, during the War, when he served overseas as Captain of the 150th Field Artillery, but continued upon Mr. Peck's return from abroad, until 1922. For the next seven years he served as Time Study Chief, Purchasing Agent, Production Engineer and Production Manager for the Real Silk Hosiery Mills, the Van Dorn Iron Works, and the Columbus Handle & Tool Co. In 1929, Mr. Peck joined the Trundle Engineering Co., and is now serving as Vice President in charge of the Chicago office of that firm. In addition to his membership in N. A. C. A., he is a member of the American Management Association and the Society for the Advancement of Management.

Articles published in the *Bulletin* present many different viewpoints. In publishing them the Association is not sponsoring the views expressed, but is endeavoring to provide for its members material which will be helpful and stimulating. Constructive comments are welcomed and will be published in the Forum Section of the *Bulletin*.

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NATIONAL ASSOCIATION OF
COST ACCOUNTANTS

JANUARY 1, 1940

FURTHER THOUGHTS ON THE MANAGEMENT ASPECT OF ACCOUNTING CONTROL

By S. A. Peck, Vice President,
The Trundle Engineering Co., Chicago, Ill.

Introduction

LAST year I had the pleasure of writing for the *N. A. C. A. Bulletin* an article on "The Managerial Aspect of Controls," and as I still hold to the conviction that the techniques described in that article are fundamental to this subject, the present paper will necessarily cover some of the same ground. In that paper I discussed exterior applications; in this paper certain interior or internal applications will be presented. The subject as a whole has some unusual concepts requiring reiterative explanation, and, with your indulgence, I will briefly review certain points that are pertinent to this discussion.

Now why should an engineer like myself be talking about the management aspect of accounting control, a field properly belonging to accountants? Because accountants have been so engrossed in the *historical* aspect of accounting control—making up elaborate statements of comparison between this year, last year and the year before—that they have completely overlooked the real purpose of their figures, which is to help management look forward. History is valuable; it shows the mistakes that were made and the results of such mistakes, the benefits attained, and builds up and fortifies management's experience.

But such historical experience is retrospective in its viewpoint. Unless it becomes prospective in its application to a business problem, the real objectives of a business become obscure and indefinite. In other words, management finds itself looking into a mirror at reflections when it should be looking out of a window at desirable vistas.

First of all, what is the management aspect of accounting control? Undoubtedly there are many aspects, but from management's viewpoint, which is the one I am taking, there is only one aspect, which is defined as follows: That accounting control serves its function correctly, only when it properly *relates* the operating activities of a business (selling, manufacturing and administra-

tive) to their respective costs. The word "relates" is used advisedly, in its true meaning of connecting the various activities to their respective costs. And when two things are connected, any action or result on one of them immediately and intimately affects the other. That is the management aspect of any control—a quick, responsive connection between cause, effect and remedy.

Accountants and engineers have developed an assortment of techniques and mechanisms to bring out this relationship. Fundamentally they all spring from the "profit-volume-expense" relationship first presented articulately to industry by pioneers in the cost and management engineering field some years ago. Modern practice has crystallized these techniques into a single "profit-volume-expense" concept which we have chosen to call the Marginal Income Method.

My major premise therefore is that the management aspect of accounting control is best satisfied by the use of the marginal income method, or one similar to it, of analysis and interpretation of the accounting data and records.

Definitions

Before entering into a discussion of the application of the method, it will be well to define once more some of the basic terms used.

What is marginal income? Merely this: It is the difference between total income, and the sum of all variable costs of a business. It is the amount, therefore, available for the payment of all fixed expenses and profit.

And what is meant by variable and fixed expenses? By variable expenses is meant those expenditures that vary directly and automatically with the activity producing them. Thus, direct labor, direct material, commissions, supplies and social security taxes on direct labor would all be classified as variable expenditures.

Fixed expenses, on the other hand, include only those expenses that remain constant regardless of activity, except when adjusted by the exercise of administrative policy. That is to say, a fixed expense will not vary except through arbitrary action of management. Thus, taxes, insurance, depreciation, officers' salaries and a host of others are all true fixed expenses.

Between these two classes of expenditures is an intermediate class of expense that has the composite aspect of being partly fixed

and partly variable. These are called semi-fixed expenses, and will be given more elaborate explanation later.

One more definition—for break-even volume. It is defined as the sales volume at which the marginal income has exactly absorbed the fixed expenses, and the enterprise neither enjoys a profit nor suffers a loss.

Exterior Applications

The previous article on this subject stressed its *exterior* applications, such as the effect of pricing, sales volume and costs on the profit-volume relationship. Briefly reviewing this phase, it was found that there are five very important aspects concerned with costs and pricing:

1. A change in the amount of fixed expense of a business changes the break-even point, but not the marginal income ratio or the progressive rate of net profit.
2. A change in the variable cost ratio changes the break-even point, the marginal income ratio and the progressive rate of net profit.
3. A change in both fixed and variable costs changes to a still greater degree the break-even point, the marginal income ratio and the progressive rate of net profit.
4. A change in the selling price only has the same effect as a change in the variable cost.
5. The marginal income ratio is affected only by changes in selling price or variable cost.

In addition, three important financial conclusions can be drawn from the relationships just described:

1. When the marginal income ratio is low, say between 10 per cent and 15 per cent, large changes in volume are required to produce any considerable profit or loss. If large increases in volume are attained, particularly at a rate greater than the marginal income rate, a business quickly and automatically gets into serious financial difficulties if it is operating with limited working capital.
2. On the other hand, if the marginal income is high, say about 35 per cent, small increases in volume produce large profits, an easy cash position and a big surplus. However,

if the volume is not under control, equally large losses can be experienced when the volume drops below the break-even point, and the business can "lose its shirt" in jig time.

3. The most satisfactory range for the marginal income ratio in businesses of average size lies between 15 per cent and 35 per cent, preferably at 25 per cent.

Interior Applications

At this time I want to place the emphasis on the *interior* or internal applications of the marginal income technique, particularly its use in—

1. Cost control through the three basic cost elements of material, labor and expense;
2. Its suitability for the analysis of product profit-volume relationship; and
3. Its adaptability to the construction of pro forma statements and profit forecasts, for a variety of elected or proposed conditions.

A word as to cost control, which is differentiated from cost accounting and cost finding. *Cost accounting* is concerned with the recording and reconciling of the various elements of cost entering into a process or product. *Cost finding* is concerned primarily with the analysis of the cost elements, to show where and why such costs were created, and to find a base upon which a selling price can be established. *Cost control* concerns itself chiefly with methods of control, that is, the establishment of procedures and control mechanisms that will restrict or control the material, labor and expense elements of cost to the desired or predetermined amount.

These distinctions are important, because the major premise of this paper is based upon "relationship," which through proper control provides direction and limits over future activity.

Construction Techniques

Before a detailed discussion can be entered into, on the application of these controls, a little chore work must be done with figures and charts, to visualize the concept and to give specific point to my explanations.

The Auto Accessory Company, an imaginary corporation, will furnish the necessary figures (see Chart A) for example use. I

CHART A

THE AUTO ACCESSORY COMPANY

Consolidated Operating Statement—1939

	January	February	March	April	May	June	July	August	September	October	November	December	TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	
Gross Sales	$56,000	$76,000	$94,000	$103,000	$114,000	$125,000	$141,000	$189,000	$160,000	$130,000	$ 65,000	$ 47,000	$1,300,000
Returns*	4,000	6,000	7,000	8,000	9,000	10,000	11,000	14,000	12,000	10,000	5,000	4,000	100,000
NET SALES	$52,000	$70,000	$87,000	$ 95,000	$105,000	$115,000	$130,000	$175,000	$148,000	$120,000	$ 60,000	$ 43,000	$1,200,000
Cost of Sales	$40,000	$50,000	$63,000	$ 70,000	$ 75,000	$ 74,000	$ 90,000	$120,000	$100,000	$ 85,000	$ 50,000	$ 35,000	$ 852,000
GROSS PROFIT	$12,000	$20,000	$24,000	$ 25,000	$ 30,000	$ 41,000	$ 40,000	$ 55,000	$ 48,000	$ 35,000	$ 10,000	$ 8,000	$ 348,000
Administrative Expense	$ 7,000	$ 7,200	$ 7,300	$ 7,500	$ 7,600	$ 7,500	$ 8,800	$ 8,400	$ 8,000	$ 7,700	$ 7,000	$ 8,000	$ 92,000
Selling Expense	12,000	15,000	16,000	18,000	18,000	20,000	20,000	28,000	25,000	22,000	13,000	13,000	220,000
TOTAL	$19,000	$22,200	$23,300	$ 25,500	$ 25,600	$ 27,500	$ 28,800	$ 36,400	$ 33,000	$ 29,700	$ 20,000	$ 21,000	$ 312,000
OPERATING PROFIT (LOSS)	$(7,000)	$(2,200)	$ 700	$ (500)	$ 4,400	$ 13,500	$ 11,200	$ 18,600	$ 15,000	$ 5,300	$(10,000)	$(13,000)	$ 36,000
Other Income	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 2,000	$ 2,000	$ 2,500	$ 2,500	$ 1,500	$ 1,500	$ 2,000	$ 2,000	$ 20,000
Other Expense	1,100	1,800	1,700	1,800	1,800	1,800	1,500	1,500	1,800	1,800	1,500	1,900	20,000
TOTAL †	$ (100)	$ (800)	$ (700)	$ (800)	$ 200	$ 200	$ 1,000	$ 1,000	$ (300)	$ (300)	$ 500	$ 100	.....
NET PROFIT (before Federal Taxes	$(7,100)	$(3,000)	.....	$ (1,300)	$ 4,600	$ 13,700	$ 12,200	$ 19,600	$ 14,700	$ 5,000	$ (9,500)	$(12,900)	$ 36,000

* Excluded because credited to inventory.

† Considered only when related to operation of business.

must warn you, however, that all these examples and figures have been most carefully "streamlined" to give perfect answers and to simplify the explanations. In actual practice any figures used may not give such easy, consistent answers, and their interpretation and application may not produce the clear patterns developed in the examples used. In fact, they hardly ever do!

Most charts used for relating performance and objective, use time and amount as scales of measurement, and give merely a chonological picture of what happened. To be sure, a limited amount of control can be exercised from such media, but a time-and-amount relationship has only historical value, and will not provide absolute measures for projection. Who knows what amounts are proper tomorrow, or next week, or next month?

On the other hand, if the factors are *related,* we are not concerned with time, except as a reference point, and the occurrence of one amount will automatically determine the other, so that performance and objective are in a controllable relationship with each other.

Ratio Charts for Material and Labor

A simple technique for finding this relationship is to construct ratio charts in which one mathematical value is expressed in terms of another, thus defining the relationship of the two functions over their entire range of values. For example, the major divisions of factory overhead can be plotted on a vertical scale against direct labor shown on a horizontal scale. Lines drawn through the points for each expense classification will intersect the vertical scale, erected from the zero point of the labor scale. If the expenditure plotted is a true variable, the line drawn will pass through the zero point of the intersection of the two scales; if a true fixed expense, the line will run parallel to the horizontal scale at some point above zero; and if a semi-fixed expense, the line will intersect the vertical scale at an angle at some point above zero. The intersection of any line with the vertical scale at a point above zero indicates the fixed expense in that division, for the range of activity considered.

This qualification—range of activity—is important, as it is readily understood that if activity actually diminished to zero, the charted line would accelerate its fall for most classes of expense so that at actual zero, the fixed expense would be a great deal

smaller, or actually disappear. Theoretically, the line representing a semi-fixed expense is parabolic in form. In practice, it is considered as a straight line for the obvious reason of practicability.

Illustration of the Ratio Method

Now look at Chart B, taken from the Auto Accessory Company statements, which illustrates the ratio method in detail. Against a horizontal scale representing direct labor and a vertical scale representing total factory overhead, is plotted each month the actual overhead incurred against the actual labor. A series of points results, numbered from 1 to 12, for each month of the year.

The question at once arises, what is the relationship? To paraphrase Gilbert and Sullivan, "we must become slightly mathematical." First, the average point for labor and overhead for the twelve months is found, represented on the chart by "X." Through it a straight line is drawn intersecting the greatest number of points as shown. The vertical scale is intercepted at $9,000, indicating that the relationship between labor and overhead is semi-fixed, and that factory overhead contains $9,000 of fixed expense. The *slope* of the line represents the variable content of the overhead and is found to rise at the rate of $75 for each $100 of labor, indicating that the variable overhead is 75 per cent of direct labor. The relationship between factory overhead and direct labor expressed monthly is $9,000, plus 75 per cent of direct labor. Daily it would be $300 plus 75 per cent of direct labor, and annually it would be $108,000 plus 75 per cent of direct labor.

In the box on the chart is contrasted the conventional method for expressing overhead with the ratio method just described. From the viewpoint of control, it is obvious that the conventional method lacks the facility inherent in the ratio method for analysis and projection.

Applying this method in a more detailed breakdown of the factory overhead, it is discovered in Chart C, that the factory overhead consists of—

Fixed Charges	$3,000 per month, plus	0%	of Direct Labor
Indirect Labor	0 per month, plus	50%	of Direct Labor
Expense	6,000 per month, plus	25%	of Direct Labor
TOTAL	$9,000 per month, plus	75%	of Direct Labor

This analysis can be carried into the detail accounts, and in practice is carried down to the individual account.

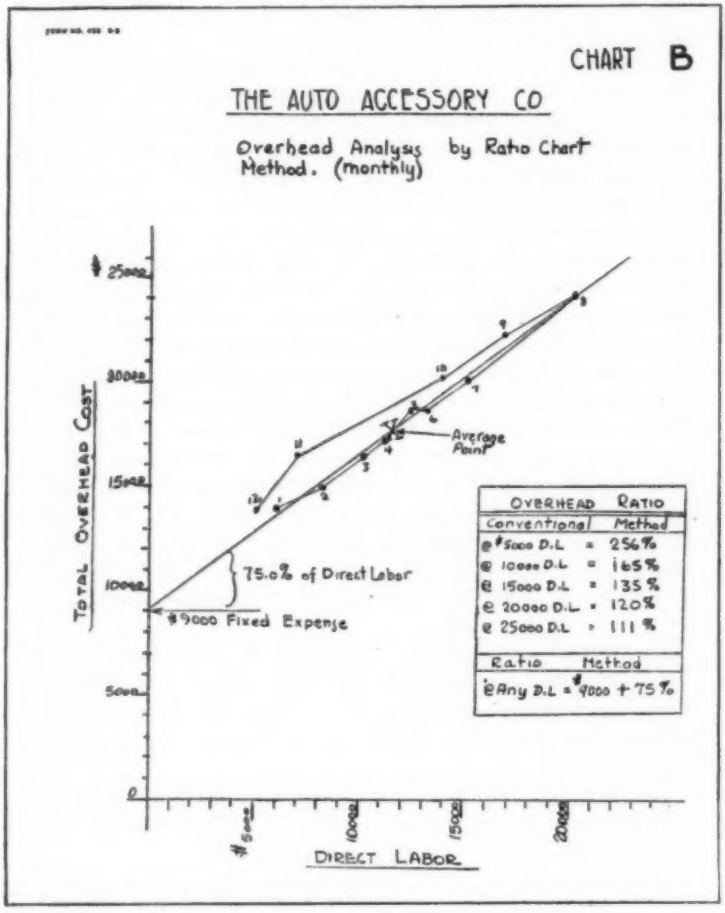
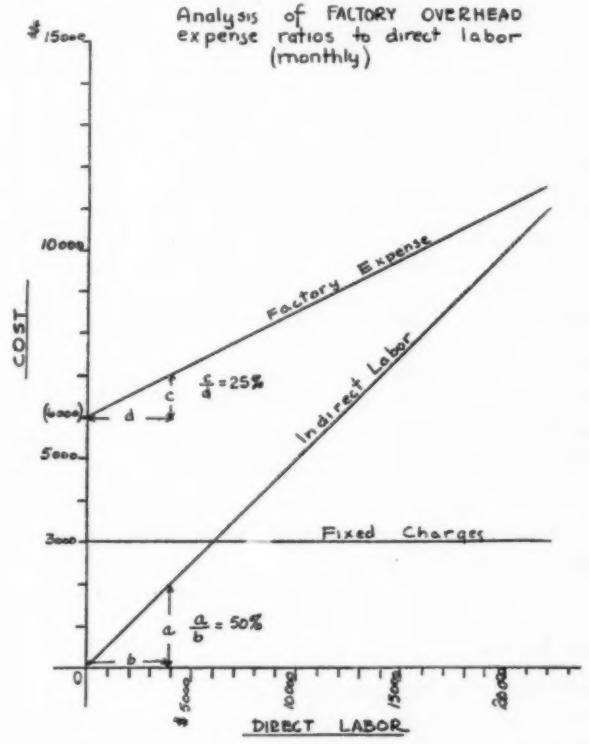


CHART B
THE AUTO ACCESSORY CO
Overhead Analysis by Ratio Chart Method. (monthly)
TOTAL OVERHEAD COST
DIRECT LABOR
$25000
$20000
$15000
$10000
$5000
0
$5000
10000
15000
20000
Average Point
75.0% of Direct Labor
$9000 Fixed Expense
OVERHEAD RATIO
Conventional Method
@ $5000 D.L = 256%
@ 10000 D.L = 165%
@ 15000 D.L = 135%
@ 20000 D.L = 120%
@ 25000 D.L = 111%
Ratio Method
@ Any D.L = $9000 + 75%

CHART **C**

THE AUTO ACCESSORY CO

Analysis of FACTORY OVERHEAD expense ratios to direct labor (monthly)



The same approach is made to all the other major classifications of the operating statement, and, as finally shown on Chart D (which carries the analysis down to products), the total fixed expense per month reaches $20,500, and the total variable (in terms of the sales dollar) reaches 76.5 per cent.

CHART D

PRODUCT MARGINAL INCOME

	Product A		Product B		Product C		Total	
	$	%	$	%	$	%	$	%
Gross Sales		109.0		107.0		100.0		108.0
Returns		9.0		7.0				8.0
NET SALES		100.0		100.0		100.0		100.0
Allowances				4.0		1.0		1.5
Direct Labor		6.0		15.0		30.0		11.5
Direct Material		55.0		15.0		30.0		40.5
Mfg. Overhead	3,500	10.0	3,500	5.0	2,000	10.0	9,000	8.5
MANUFACTURING TOTAL	3,500	71.0	3,500	39.0	2,000	71.0	9,000	62.0
Administrative Expense	2,500	2.0	3,500		500		6,500	1.2
Selling Expense	1,700	12.2	3,000	20.0	300	1.0	5,000	13.3
GENERAL EXP. TOTAL	4,200	14.2	6,500	20.0	800	1.0	11,500	14.5
GRAND TOTAL	7,700	85.2	10,000	59.0	2,800	72.0	20,500	76.5
Marginal Income		14.8		41.0		28.0		23.5
Break Even Vol.	52,000		25,000		10,000		87,000	
Actual Volume	59,000		29,000		12,000		100,000	
PROFIT OR (LOSS)	1,040		1,600		560		3,100	

By earlier definition, the marginal income is therefore 23.5 per cent. The next problem is to find the break-even point. This is simple. If there is 23.5¢ available out of every sales dollar to pay for the fixed expenses, and the total fixed expense is $20,500, then the break-even point will be $20,500 divided by .235, or $87,000 in round figures.

Construction of a Marginal Income Chart

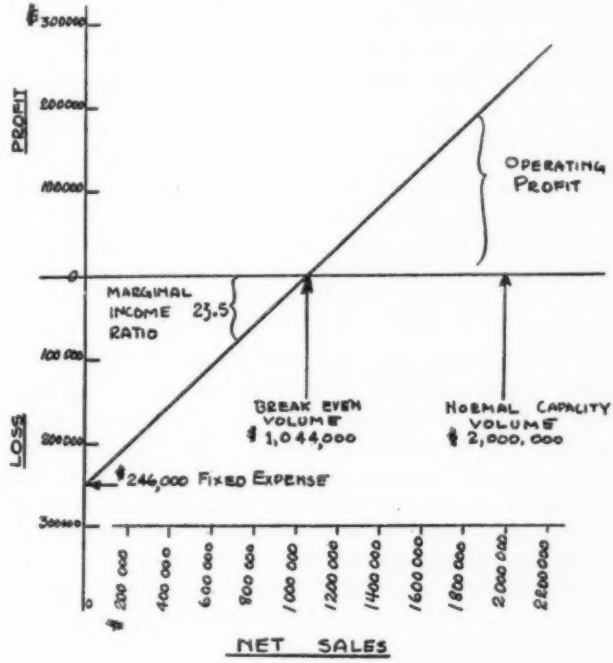
The construction of a marginal income chart becomes easy and is shown in Chart E, which has been converted to an annual basis for use in making up pro forma statements.

From a base line representing the total cost for any sales volume, a profit and loss scale is drawn through the zero point of sales volume. At zero volume the loss is naturally the fixed expense, so through this point and a point measured off for the break-even

CHART E

THE AUTO ACCESSORY CO.

Marginal Income Chart (Annual)



volume on the horizontal line, another line is drawn, which is the "marginal income line." This graph indicates clearly how the given marginal income determines the profit at various sales volumes. For example, the maximum amount of net profit that can be earned will be dependent upon the relation of the break-even volume to the plant capacity volume. The net profit can never equal the marginal income, although if the break-even volume is less than 50 per cent of the capacity volume, it may come close to it.

On the other hand, if the break-even volume lies close to the capacity volume, even though the marginal income is large, the net profit attainable will be very small. Referring again to Chart E, if the break-even point shown for the Auto Accessory Company represented 80 per cent of its capacity, then $1,300,000 would be the greatest volume that could be produced and the best operating profit obtainable would be only 4.3 per cent of sales. If the break-even volume represented only 50 per cent of capacity, then a net profit of approximately 11.2 per cent could be expected on the maximum volume of $2,000,000, *provided of course* that the cost of securing and producing such a volume did not alter the fixed and variable expense relationships and inject the law of diminishing returns.

The value of this chart for control purposes is rather clear. It can be constructed on a monthly basis, and each month the actual profit and loss for any given sales volume can be spotted and the variance from the desired line quickly noted. Conversely, knowing the sales volume each month the expected profit can be predicted long before the books are actually closed, assuming, of course, that no untoward changes in cost have occurred, and that the cost ratios have been accurately determined.

Or, at any time in a month the amount of sales yet required to break even or yield a predetermined profit can be found. For example, if the sales on the fifteenth of the month equal the break-even volume, all sales made after the fifteenth will have a profit equal to the marginal income.

Cost Control

With the overall picture now in mind, let us return to the subject of cost control, an important management aspect. Cost control is

defined as consisting of material control, labor control and expense control.

The assumption that material and labor are true variables is sound, and their actual control is a matter of operating procedures, the results of which can be currently evaluated by the graphical method previously described. However, considering material cost control first, the point must be made that the basic principle of this control is quantitative. This means that the material control must be incorporated in the production control routine, which is concerned primarily with quantity or units of material rather than with its cost. The conversion of such transactions into value becomes a cost finding and accounting function, whose results can be used to measure the effectiveness of the control as just described.

Labor cost control originates in labor standards applied to each workman's daily performance, measuring his effectiveness and serving as a prime element in the cost finding procedure. The result of such control is evaluated in the timekeeping and payroll departments, and its effectiveness is interpreted to management by such graphical presentations as were outlined earlier.

The control of expense offers a more direct field of operation to management as it reaches closer to management's functions, and certain divisions of expense actually lie within management's personal jurisdiction. Much might be said about expense control. If we accept the principle that overhead expense is best controlled by budgetary procedures, the management aspect becomes clear.

Expense Control

The first requirement of such expense control is flexibility, meaning that expenditures must be matched to the volume or activity creating them, and not to a sales forecast or a payroll estimate that may be exceeded or may not be attained. The practical problem, therefore, in setting up a flexible budget for expense control is the determination of the budget standards. Since expenses must be *related* to the activity creating them, the separation of expense into its fixed and variable components becomes essential, as has already been described.

In considering expense from the budgetary control angle, its overhead application is disregarded. That is to say, expenses are considered from the viewpoint of *relation* rather than *application*. Overheads are usually applied in a departmentalized form, and

such charges represent a subdivision of expenses that has only abstract significance. Therefore, for control purposes, an expense should be accumulated and interpreted as a distinct entity rather than as a distributed amount. For example, a power bill of $5,000 per month will be more informative to management as a single item related to the entire plant activity, than as ten items of $500 per month scattered over ten cost or budget sheets; especially when it is known that such distribution can have very little inherent accuracy. It all gets back to a very elemental principle of control, that it is easier to control a river at its sources than at its mouth.

It is desirable, if expense control is to be a management tool, that the result of such control be currently and properly shown. The chart method shown in Charts B and C is most valuable for this purpose. A separate chart can be drawn for each expense account based either upon past experience (which is not recommended) or upon some selected and acceptable standard. At the end of each month the actual expenses can be plotted on their proper charts and the points connected in sequence. The chart will immediately show whether, with increasing production, the actual points are below or above the standard line; or with decreasing production, whether there is a lag in keeping expense in its proper relation to activity, as would be evidenced if the actual points drift away from the standard line.

Direct labor and direct material can be treated in the same way. In this case, they must be chartered against the cost of sales, or the cost of production, if there is considerable variation in the inventory balance each month. Sometimes, when this is done with these prime costs, which should be completely variable, the charts indicate a fixed expense. This is management's cue to get busy at once. A fixed expense in the direct labor cost may mean that on low volumes, direct labor has been placed on non-productive work without reporting it, or has reduced its productivity. A fixed expense in the direct material cost may mean an increase in waste, errors in the inventory control system or in the costing of material. In either case the management aspect of control is clearly evidenced.

Product Analysis

Another interior application of the marginal income technique is the analysis of product volumes and cost. Referring once more to

Chart D, it will be noted that the marginal income has been broken down by three products, A, B, and C, into the same cost elements shown in the total.

This analysis indicates the wide differences that may be found in a plant making diversified products. The range of marginal incomes is illuminating, Product A with 14.8 per cent, Product B with 41.0 per cent and Product C with 28.0 per cent. It is obvious that the amount of fixed expense chargeable to each product will have an important bearing on the relationship between break-even volume and plant capacity.

For example, if Product A doubled its volume to $118,000 the resulting profit of $9,800 would be no greater than that added by $20,000 additional sales by Product B; yet the effect of an additional $59,000 volume in the plant might be disastrous to schedules, deliveries and capacity, whereas an added $20,000 volume by Product B might fit into the operation without causing a ripple and produce the same profitable result.

On the other hand, a small reduction in the fixed expense of Product A, say $1,000, would reduce the break-even point to $45,000, and on the same volume of $59,000 would double the profit to $2,080; whereas the same fixed expense reduction on Product B would reduce the break-even point to only $22,000, and only increase the profit to $2,880 or 80 per cent. If the $1,000 reduction could be attained on Product C, the break-even point would drop to $6,400 and the profit on the same volume would become $1,570, or an increase of 180 per cent.

Against these relationships must be measured the desirability of securing a greater *amount* of profit, rather than a greater *rate*; in which case it becomes obvious that the product with the greatest marginal income will have the largest amount of profit increase for a given reduction in fixed expense.

Use of Marginal Income for Testing Proposed Action

These three product costs (which are based upon an actual operation), illustrate some other interesting aspects, particularly in labor, material and selling expense. Thus, Products A and C have the same manufacturing total, but a very dissimilar relationship in labor and material, pointing out to management some obvious points for control. These two products end up with quite different

marginal incomes because of a great difference in the variable selling costs. On the other hand, Product B, which has the highest variable selling cost, also has the highest marginal income, which gives a significant point for consideration, that possibly considerable sales resistance is being encountered.

Product marginal incomes also offer an opportunity for testing the effect of reduced or increased selling prices. For instance, it is frequently stated by optimistic sales managers that if the selling price were reduced 10 per cent they could "set the world afire" with a demand for the product. Take Product A, for example. If a 10 per cent reduction in selling price was made the marginal income would drop to 4.5 per cent, and the break-even sales volume would then become $171,000, or nearly three times the current volume. It would be an unusual situation where a 10 per cent reduction in selling price would produce such an enormous increase in volume.

Such considerations will point out frequently that it is better to seek a reduction in fixed or variable expense and take a smaller volume at the "hard-to-get" selling price, than it is to pursue the "will-o'-the-wisp" of lower selling price and large volumes.

Many companies have found that a cultivation of such a premium market and the resulting moderate volumes, produces more profit (and less wear and tear on management) than large volumes and smaller profit margins. However, such a policy should be adopted only after a most careful study has been made of the relative merits of these two plans of operation.

Profit Projection

And now we come to an interior application, which to me is the most interesting of all, the use of marginal income for forecasting. The automatic formulation of fixed and variable expense and their reduction to a simple formula of profit-volume relationship, makes the construction of a profit forecast very easy.

The mechanics of construction are rather simple, and requires merely that all the fixed and variable expenses for each product be summarized, and then applied singly to the sales volumes selected for each product, and in any combination of products desired. Because the fixed and variable expense factors are different for each product, the grand totals must be determined by adding all the

product's extensions. A grand total, made up from the total fixed and variable expense factors shown in Chart D, would only be true when the product volumes selected bore the same relation to each other that they did when the total fixed and variable expense was determined.

In other words, even though each product's marginal income remains unchanged, the composite total will vary according to the different product volumes included in the total volume.

In Chart F, there are set up four possible cases that the Auto Accessory Company's management have considered; and the chart illustrates the ready use of the marginal income method for evaluating any given program or plan of operation.

CHART F

	Product A	*Product B*	*Product C*	*Total*
CASE I—VOLUME 50% OF CAPACITY. NORMAL PRODUCT DISTRIBUTION.				
Net Sales	$ 590,000	$290,000	$120,000	$1,000,000
Variable Cost	502,700	167,200	86,400	756,300
Fixed Cost	92,400	120,000	33,600	246,000
Total Cost	595,100	287,200	120,000	1,002,300
Operating Profit (Loss)	(5,100)	2,800	.....	(2,300)
CASE II—VOLUME 75% OF CAPACITY. NORMAL PRODUCT DISTRIBUTION.				
Net Sales	$ 870,000	$450,000	$180,000	$1,500,000
Variable Cost	741,200	265,500	129,600	1,136,300
Fixed Cost	92,400	120,000	33,600	246,000
Total Cost	833,600	385,500	163,200	1,382,300
Operating Profit (Loss)	36,400	64,500	16,800	117,700
CASE III—VOLUME 75% OF CAPACITY. ABNORMAL PRODUCT DISTRIBUTION.				
Net Sales	$1,000,000	$300,000	$200,000	$1,500,000
Variable Cost	852,000	177,000	144,000	1,173,000
Fixed Cost	92,400	120,000	33,600	246,000
Total Cost	944,400	297,000	177,600	1,419,000
Operating Profit (Loss)	55,600	3,000	22,400	81,000
CASE IV—VOLUME 100% OF CAPACITY. ABNORMAL PRODUCT DISTRIBUTION.				
Net Sales	$1,600,000	$300,000	$100,000	$2,000,000
Variable Cost	1,363,200	177,000	72,000	1,612,200
Fixed Cost	92,400	120,000	33,600	246,000
Total Cost	1,455,600	297,000	105,600	1,858,200
Operating Profit (Loss)	144,400	3,000	(5,600)	141,800

In Case I the management has assumed a low utilization of available capacity at 50 per cent and a normal (or experienced) volume relationship in its three products. The total volume happens to be slightly less than the break-even volume, shown in Chart E, and naturally no profit is to be gained from the operation, although the three products show individually all three conditions of profit, loss, and break-even.

Management therefore decides to raise its objective 50 per cent and plan the company operation at 75 per cent of capacity, with no change in the relative volume of the three products. As shown in Case II, all three products show profits but combine into a total that some of our mythical management believes is too low.

Our mythical sales manager therefore proposes that the volume be redistributed according to the plan illustrated in Case III, claiming that the loss of volume in Product B will be offset by the increased profits from Products A and C. The projected figures immediately prove him to be somewhat of a false prophet in his profit-volume understanding, as the total profit is even less than in Case II.

Any other combination of product volumes and capacity can be taken, for example Case IV, which shows a 100 per cent use of capacity and a profit not much greater than that of Case II, due to the fact that all the increase is taken in the product with the lowest marginal income.

Illustrating the point made earlier regarding the composite marginal income, it will be noted that the total marginal income for Case I is 24.4 per cent, for Case II 24.4 per cent, for Case III 21.8 per cent, and for Case IV 19.4 per cent.

In concluding this discussion of the interior applications of the marginal income method of control, several actual case examples will summarize the various applications that can be made.

Case Study I

Case I was that of a tire company making a line of auto tires for distribution through its own dealer organization and also through a large auto supply chain. The dealers took 30 per cent of the company's production, and the auto supply chain took 70 per cent. The tires sold by the dealers had an average marginal income of 25 per cent, a safe adequate spread; but the special brand tires had only 15 per cent average marginal income. In securing the chain's tire contract for the next year, the sales manager had cut his price 15 per cent on one tire, comprising 50 per cent of the chain volume, in order to give the chain a leader, and without much thought as to the full effect of his action. An analysis of the effect of this price cut showed a reduction of the marginal in-

come to 5 per cent on this particular item. In turn, this reduced the average marginal income of the special brand line from 15 per cent to 10 per cent, and the average marginal income of all lines from 18 per cent to 14.5 per cent. As a result, the break-even volume of $3,600,000 annually, was raised to $4,500,000 on an expected volume of only $5,000,000.

When this bombshell hit the general management, it looked as though it had let itself in for a serious reduction in its profit. A very critical examination was made of the fixed expenses, and by a little belt tightening here and there, they were reduced, so that the break-even point dropped back to $4,000,000. The resulting profit of $145,000 was nothing to shout about, but it at least left the company with a margin of safety that it would not have had otherwise.

Several months later, I learned that there was a new sales manager on the job, who made it an unbreakable rule of conduct that no price changes could be made until the accounting department had made a complete profit-volume projection with the new prices.

Case Study II

Case II was that of a road-building equipment company that increased its projected volume 100 per cent on one product by taking on a large government contract for one of its low priced units, one with a marginal income of 10 per cent, whereas its other units averaged around 25 per cent. When the company got into production it discovered, to its great consternation, that the 100 per cent increase in volume in this product was 12½ per cent greater than the plant's total normal capacity, and, in order to make deliveries, it would have to abandon part of its regular production. The figures ran something like this:

Normal capacity	$1,000,000
Break-even volume	500,000
Present volume	750,000
Present profit	43,700
Proposed volume	1,125,000
Possible volume	1,000,000
Possible profit	50,000

This showed a 15 per cent increase in profit, for a 33⅓ per cent increase in sales; and a decrease in volume on the 25 per cent marginal income product from $375,000 to $250,000, by forced abandonment of specific accounts.

Only one course of action was possible, to sub-let enough of the contract to other sources to allow the company to retain all its regular business. Uncle Sam was willing to be a good fellow, but you can be sure that the president of this company (who made the original deal), has developed and retained a high interest in the profit-volume projections in his accounting department.

Figures are tiresome so I will close my subject without using them further.

Summary

I would like to summarize the theme of this paper by making the following points:

1. The application of profit-volume analysis to cost determinations is a proper function of the cost accountant.
2. The effective use of cost accounting requires that the cost accountant become more closely associated with management in the formulation of fiscal policies.
3. The marginal income technique provides a supplementary tool in accounting practice that will give management a clearer understanding of, and a better control over, its profit-making decisions.
4. Intelligent presentation of the profit-volume relationship to management by the cost accountant will make his function an essential one in the operation of a business and lift it from a routine job into one of executive rating.
5. The opportunity for the cost accountant to help management follow a profitable course in the operation of a business is greater today than it has ever been; *but* it is an opportunity that can be developed only by a wider understanding and a definite desire on the part of the cost accountant to make his job vital to management's control over the business.

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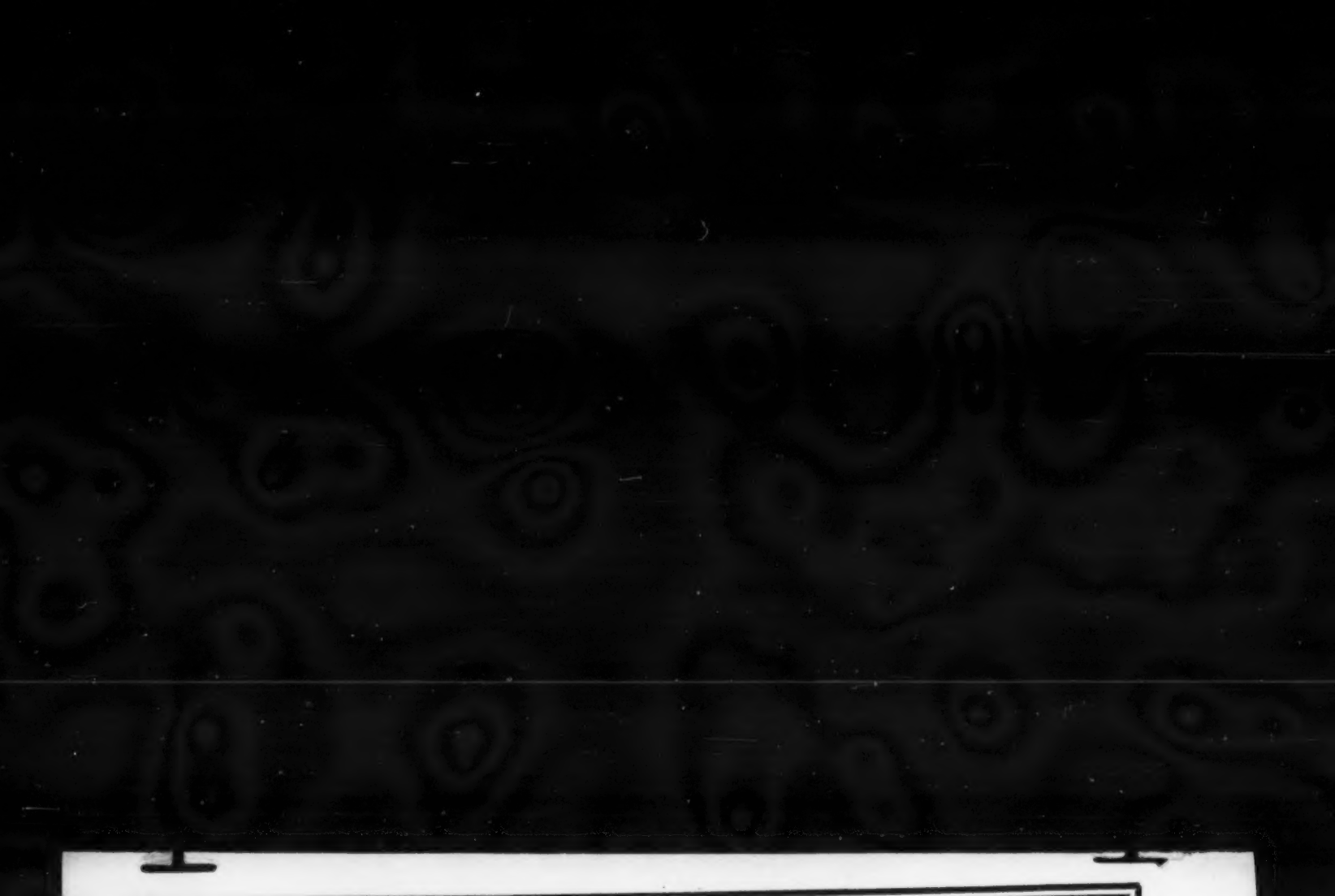
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